BRAND NAME OR EQUAL Princeton Instrument emICCD DETECTOR WITH SPECTROGRAPH

1. PART NUMBER: Princeton Instruments PM4-1024EMB-SB-FG-18-P43-SM OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
Electron-multiplying intensified charge coupled device (emICCD) detector

1) 1024x1024 pixels sensor
2) Back-Illuminated Frame Transfer EMCCD
3) 13.5um pixel pitch
4) Intensifier peak QE> 20% in the in the UV detection range
5) 8 frames/sec readout at full 1024x1024 resolution
6) Minimum Intensifier Gate Width (Intensifier Exposure Time) 2-3ns
7) Dual Gains: Intensifier MCP Gain and EMCCD Gain
8) Gains can be run in "Optimum Mode" 1/3 MCP Gain, 2/3 EMCCD Gain
9) P43 Phosphor
10) Digitization Rates: EM Mode (5MHz and 10MHz), Normal CCD Mode (500kHz, 1MHz and 5Mhz)
11) Gating Modes: 1) Repeated Gate Width -Gate Delay 2) Sequential Mode for lifetime measurements
12) Built-In Programmable Timing Generator
13) Built-In Programmable continuous frequency output to synchronize external devices like lasers

Explaining how some of the emICCD specifications translate into capabilities:

1) The emICCD detector shall run in an optimum gain mode where 1/3 of the gain is from the intensifier. 2/3 of the gain is from the EMCCD channel. This optimizes the linearity of the data over a regular gated ICCD.
2) The dual gain mechanism (combination of the EMCCD Gain and intensifier gain) shall generate up to 10,000X gain and true photon counting.
3) The emICCD detector shall use a frame transfer EMCCD for single photon counting. The fast clocking frame transfer EMCCD (over regular CCDs) reduces pulse pileup in a single photon counting measurement.
4) The gated sequential capture mode of the emICCD shall allow the capture of the decay of the signal.
5) Using the emICCD continuous frequency output shall allow the detector to control pulse trains (repetition rate) to the laser.

2. PART NUMBER: Princeton Instruments ISO320-19-NS-NP-MS-SM-NS-G3-UJ OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
Schmidt-Czerny-Turner (SCT) spectrograph:

1) Zero-Astigmatism Spectrometer
2) 320mm Focal Length Schmidt-Czerny-Turner imaging spectrograph
3) Spectral resolution of 0.06 nm or better, binning up to 200 rows at 435 nm with a 1200 gr/mm grating.
4) Zero astigmatism at any wavelength with any grating at all points in the 27mm wide focal plane.
5) Even Spectral Resolution across all points of the spectral plane
6) Fine Mirror focusing with internal micrometer adjustment separated from the optical assemblies.
7) Internal angle of 17.7°.

Explaining how some of the specifications of the SCT spectrograph translate into capabilities:

1) Maximum peak height at all points across the detector will be maintained.

Signal will fall onto the entrance slit in a vertical fashion. Because there is no astigmatism in the SCT system, many pixels can binned (added in hardware) without loss of resolution while increasing signal to noise ratio in the experiment where light levels are very low.

3. PART NUMBER: Princeton Instruments GR9HVA-GR9GCA-GR9DCA-G3 OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

1) Optimized UV Blazed holographic grating, 68x68 mm, 1800 G/mm
2) Ruled grating, 68x68 mm, 1200 G/mm
3) Ruled grating, 68x68 mm, 300 G/mm

4. PART NUMBER: Princeton Instruments 4412-0137 OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

1) Software for spectral data acquisition
2) Real-time and offline data analysis
3) Shall support the following parts:
    a. PM4-1024EMB-SB-FG-18-P43-SM (Detector) or equal
    b. ISO320-19-NS-NP-MS-SM-NS-G3-UJ (Spectrograph) or equal

5. PART NUMBER: Princeton Instruments LG-455-020-3 OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

1) Fiber optic bundle, 190 nm to 1100 nm
    a. Bundle of 19 fibers of 200 micrometer core diameter.
2) SMA connector at illumination end
3) 10 mm ferrule at slit end

6. PART NUMBER: Princeton Instruments FC-446-021-U OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

1) Universal fiber coupler with XY micrometer control
    a. 0.12 inches of travel
2) Interchangeable 10 mm diameter ferrule
3) SMA-905 and FC inserts
4) Includes slit baffle

7. PART NUMBER: Princeton Instruments 9000-170 OR EQUAL IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

1) Light source with integrated Hg and Neon-Argon lamps for wavelength calibration
2) USB compatible
3) Lamp designed to be mounted to the spectrometer entrance slit
4) Supported by acquisition software:
    a. 4412-0137 or equal